



DESIGN REQUIREMENTS FOR OUTLINES OF SOLID STATE AND RELATED PRODUCTS

JEDEC PUBLICATION 95 (JEP95) DESIGN GUIDE 4.7

Die-Size Ball Grid Array Package (DSBGA)

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

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DIE-SIZE BALL GRID ARRAY PACKAGE DESIGN REQUIREMENTS

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4.7 DIE-SIZE BALL GRID ARRAY PACKAGE (DSBGA)

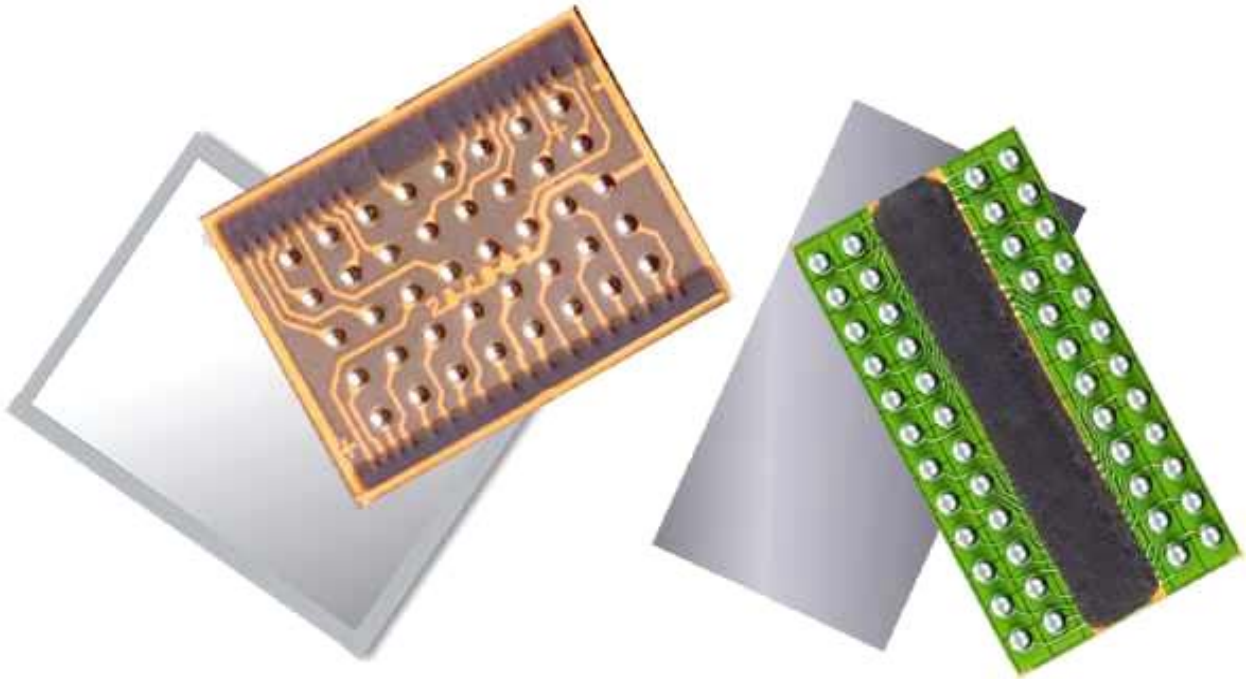


FIGURE 4.7-1
Die-size Ball Grid Array (DSBGA) Packages

4.7 Die-size Ball Grid Array Package (DSBGA)

4.7.1 Introduction

A Die-size Ball Grid Array (DSBGA) has an array of metallic balls on the underside of the package. The substrate or carrier of the package may have a square or rectangular shape with a metallized circuit pattern applied to either or both sides of a dielectric structure. The semiconductor die is attached to the top surface of this dielectric carrier. On the underside of the dielectric the array pattern of metallized balls provides the mechanical and electrical connection from the package body to the next level component such as a printed circuit board. The surface to which the die is attached may be encapsulated by various techniques to protect the semiconductor. The size of the substrate or carrier is as close to the die size as practically possible.

4.7.2 Scope

This Design Requirement standard defines the symbols, definitions, algorithms, and specified dimensions and tolerances for Die-size BGA packages. The specification uses metric dimensioning per JEDEC Publication 95 (JEP95), SPP-003, and adheres to geometric dimensioning and tolerancing methods defined in ASME Y14.5-2009.

This document is a companion to Design Standard 4.5 for Fine-pitch, Square BGA (FBGA) outlines and Design Standard 4.6 for Fine-pitch, Rectangular BGA (FRBGA) outlines.

This design guide does not attempt to document all DSBGA designs being produced. It establishes the design requirements that shall be followed for future DSBGA outlines included in JEP95.

4.7.3 Terms and Definitions

4.7.3.1 “Die-Size” Ball Grid Array Package

A “die-size” ball grid array (DSBGA) is a type of BGA package where the body size is defined to coincide as closely as possible with a specific die size. This package is sometimes called a “real chip-size” BGA or CSP. The dimensions of the package body accommodate assembly only of a die with a specific size, and these body dimensions will normally change as a result of future changes in die size. The outline of the package may be square or rectangular, but this aspect ratio may also change as a given package is redesigned to conform to a new die size (4.7.7). The aspect ratio will likely differ for devices of the same functionality from multiple suppliers. The controlling factor for the standardization of DSBGA packages is the size and aspect ratio of the ball array (4.7.4.1).

4.7.3.2 Common Designator

The common designator for DSBGA packages takes the form <profile><aspect>DSBGA. In this document <profile> takes values as specified in JESD30. <aspect> takes the value R (for Rectangular) for packages with rectangular aspect ratios.

Refer to JEDEC Standard 30 (JESD 30) for Descriptive Designations.

4.7.3.3 Ball Contact

The contacts on the DSBGA are balls, bumps, or other protruding terminals constructed from a variety of alloy and/or polymer materials. Typically, when balls are present, they consist of eutectic lead/tin solder. For purposes of this document, these contacts of whatever form will be referenced generically as “balls”.

4.7.3.4 Seating Plane

The seating plane is a plane simulated by contact of the crowns of three non-collinear balls that support the freestanding package when it is placed on a reference surface. (More than 3 balls may contact this reference surface, but at least 3 such balls are required to define the seating plane.) This surface becomes the basis for all measurements with respect to Datum C.

The triangle formed by the three balls defining the seating plane shall include the center of gravity of the device as projected on the resulting plane. If multiple seating planes exist, then the seating plane resulting in the worst ball coplanarity condition shall be used for all measurements.

4.7.3.5 Profile Height

The profile height, A, of a DSBGA is the distance from the seating plane to the highest point on the package body. This distance is measured perpendicularly to the seating plane.

4.7.4 Design Requirements

4.7.4.1 Body Size

The D and E dimensions define the body size for a DSBGA. For packages with a rectangular ball matrix, the matrix determines the orientation of these dimensions. Dimension D is the body size measured parallel to the major axis of the ball matrix, and dimension E is the body size measured parallel to the minor axis of the ball matrix. Thus, for rectangular packages D will not necessarily have a larger value than E as would be the case for an FRBGA package per JEP95, Design Standard 4.6.

DSBGAs with a square ball matrix should follow the usual JEDEC convention where $D > E$.

D and E are defined in JEP95 outlines as maximum values on 0.10 mm increments. The values are determined by rounding the actual DSBGA body size upward to the next 0.10 mm boundary. Thus, D and E values have the form y.z0 following this procedure.

4.7.4.2 Matrix Size

MD and ME represent the matrix size corresponding to body dimensions D and E respectively. The values of MD and ME for a specific DSBGA package may be less than the maximum permitted value (4.7.4.4). The full matrix represented by MDxME must be located symmetrically on the package body with respect to datums A and B (4.7.4.6). For packages with a rectangular ball matrix, MD is larger than ME.

When selecting the matrix size, the designer should consider issues relating to handling and shipping systems and to the use of sockets. For example, if ball contact during shipping is undesirable, then the matrix size should be chosen so that the package allows use of a support feature in the shipping medium.

4.7.4.3 Matrix Pitch

The array pitch for a DSBGA will not necessarily be equal for the MD and ME matrix dimensions. In such cases eD and eE represent the pitches corresponding to MD and ME respectively. When the pitches are not equal, ball dimensions and tolerances for the smaller of the two pitches will govern the definition of related package dimensions and tolerances. In such cases one of the pitches may be 1.0 mm. When eD and eE are equal, the symbol e may be used for both.

The controlling pitch of the array of balls on a DSBGA package is always <1.0 mm.